Prediction of Abrasive Waterjet Machining of Sheet Metals Using Artificial Neural Network

Nur Khadijah Mazlan, Nazrin Mokhtar, M. A. Gebremariam, and Azmir Azhari

Abstract High pressure waterjet technology has received a wider acceptance for various applications involving machining, cleaning, surface treatment and material cutting. Machining of soft and thin materials with acceptable cutting quality requires a relatively low waterjet pump capacity typically below 150 MPa. The present study attempts to predict the surface roughness during the waterjet machining process for a successful cutting of sheet metals using low pressure. Artificial neural network model was used as the method for prediction. Taguchi method with L_{36} orthogonal array was employed to develop the experimental design. A back-propagation algorithm used in the ANN model has successfully predicted the surface roughness with the mean squared error to be below 10%. This summarizes that ANN model can sufficiently estimate surface roughness in the abrasive waterjet machining of sheet metals with a reasonable error range.

Keywords Waterjet cutting · Abrasive waterjet · Surface roughness · Artificial neural network · Sheet metal

1 Introduction

High pressure waterjet technology is a relatively new process that can be used for machining, material removal, cleaning and surface treatment of various materials [1]. Many studies have been reported to explore the influence of the major abrasive waterjet (AWJ) machining process parameters on the cutting quality. In the study, AWJ is clearly versatile as it can cut through a wide range of material, environmentally friendly as there are no harmful fumes are produced, capable of thin material cutting and lastly no thermal distortion on the workpiece [1]. Generally, the Abrasive

N. K. Mazlan (✉) · N. Mokhtar · A. Azhari
Faculty of Manufacturing Engineering and Mechatronics Engineering Technology, Universiti Malaysia Pahang, 26600 Pekan, Malaysia
e-mail: nurkhadijah1997@gmail.com

M. A. Gebremariam
College of Engineering, Universiti Malaysia Pahang, 26300 Gambang, Pahang, Malaysia

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